Toward Improved Land Surface Initialization in support of Regional WRF Forecasts at the Kenya Meteorological Department

Jonathan L. Case[1], John Mungai[2], Vincent Sakwa[2], Eric Kabuchanga[3], Bradley T. Zavodsky[4], and Ashutosh S. Limaye[5]

[1] ENSCO Inc./NASA Short-term Prediction Research and Transition (SPoRT) Center
320 Sparkman Dr., Room 3008, Huntsville, AL 35805, USA. Voice: 256.961.7504, Fax: 256.961.7788
[2] Kenya Meteorological Department (KMD), Nairobi, Kenya
[3] Regional Center for Mapping of Resources for Development (RCMRD), Nairobi, Kenya
[4] NASA Marshall Space Flight Center / SPoRT Center, Huntsville, AL, USA
[5] NASA Marshall Space Flight Center / SERVIR, Huntsville, AL, USA

Flooding and drought are two key forecasting challenges for the Kenya Meteorological Department (KMD). Atmospheric processes leading to excessive precipitation and/or prolonged drought can be quite sensitive to the state of the land surface, which interacts with the boundary layer of the atmosphere providing a source of heat and moisture. The development and evolution of precipitation systems are affected by heat and moisture fluxes from the land surface within weakly-sheared environments, such as in the tropics and sub-tropics. These heat and moisture fluxes during the day can be strongly influenced by land cover, vegetation, and soil moisture content. Therefore, it is important to represent the land surface state as accurately as possible in numerical weather prediction models.

Enhanced regional modeling capabilities have the potential to improve forecast guidance in support of daily operations and high-end events over east Africa. KMD currently runs a configuration of the Weather Research and Forecasting (WRF) model in real time to support its daily forecasting operations, invoking the Nonhydrostatic Mesoscale Model (NMM) dynamical core. They make use of the National Oceanic and Atmospheric Administration / National Weather Service Science and Training Resource Center's Environmental Modeling System (EMS) to manage and produce the WRF-NMM model runs on a 7-km regional grid over eastern Africa.

Two organizations at the National Aeronautics and Space Administration Marshall Space Flight Center in Huntsville, AL, SERVIR and the Short-term Prediction Research and Transition (SPoRT) Center, have established a working partnership with KMD for enhancing its regional modeling capabilities. To accomplish this goal, SPoRT and SERVIR will provide experimental land surface initialization datasets and model verification capabilities to KMD. To produce a land-surface initialization more consistent with the resolution of the KMD-WRF runs, the NASA Land Information System (LIS) will be run at a comparable resolution to provide real-time, daily soil initialization data in place of interpolated Global Forecast System soil moisture and temperature data. Additionally, real-time green vegetation fraction data from the Visible Infrared Imaging Radiometer Suite will be incorporated into the KMD-WRF runs, once it becomes publicly available from the National Environmental Satellite Data and Information Service. Finally, model verification capabilities will be transitioned to KMD using the Model Evaluation Tools (MET) package, in order to quantify possible improvements in simulated temperature, moisture and precipitation resulting from the experimental land surface initialization. The transition of these MET tools will enable KMD to monitor model forecast accuracy in near real time. This presentation will highlight preliminary verification results of WRF runs over east Africa using the LIS land surface initialization.

Submitted to *26th Conf. on Weather and Forecasting/22nd Conf. on Numerical Weather Prediction*